IN THE TITLE

Please change the title of this application to:

STRUCTURAL ARRANGEMENTS FOR ION GENERATOR TO PROMOTE IONIZATION EFFICIENCY

IN THE SPECIFIFCATION:

The paragraph numbers below are taken from the USPTO published version of the specification.

[0016] One structural arrangement for an ~~An~~ ion generator according to the ~~invention for achieving the above objects comprises~~ inventions described herein includes a casing having an intake port and an exhaust port; an ionization electrode contained in the casing and including a first plate-like pole having a plurality of pointed ends at least on a part of its edge and a second pole opposing a flat surface of the first pole; and a high-voltage generator for applying a high voltage to the ionization electrode ~~(claim 1)~~.

[0018] According to one preferred ~~mode~~ structural arrangement of the ~~invention~~ inventions, the ion generator ~~has an arrangement wherein the~~ second pole has a discharge surface three-dimensionally curved into a convex surface ~~(claim 2)~~. The ion generator features a further lowered directivity of the corona discharge. This leads to an even greater effect to prevent the discharge from concentrating on some of the pointed ends due to the working errors or mounting errors of the poles, ensuring a more stable corona discharge. As a result, the current value of the primary winding of the transformer can be further decreased while the air ionization efficiency is further increased.

[0019] ~~It is preferred in the ion generator that~~ In one preferred structural arrangement the first pole ~~comprises~~ has a ~~star~~ star-shaped electrode ~~whereas~~ and the second pole has a spheric discharge surface ~~(claim 3)~~. This arrangement also ensures a more stable generation of corona discharge.

[0020] The ion generator may have an arrangement wherein the second pole ~~comprises~~ is shaped in the form of a flat plate inclined at a predetermined angle relative to the flat surface of the first pole ~~(claim 4)~~. The arrangement provides an even greater effect to prevent the discharge from concentrating on some of the pointed ends due to the working errors or mounting errors of the poles. This eliminates the fear that the corona discharge

may develop into the spark discharge, ensuring the stable generation of corona discharge.

[0021] Another preferred structural arrangement for the ion generator according to the ~~invention~~ inventions comprises a casing having an intake port and an exhaust port; an ionization electrode contained in the casing and including a first plate-like pole having a plurality of sawtooth-like pointed ends arranged linearly, and a second pole having a discharge surface defined by a cylinder or a part thereof and its generatrix extended in parallel with the pointed ends of the first pole; and a high-voltage generator for applying a high voltage to the ionization electrode ~~(claim 5)~~. In this ion generator as well, the first pole does not present its pointed ends directly to the second pole whereas the discharge surface of the second pole is in the form of a convex surface defined by a cylinder or a part thereof. Hence, the directivity of the corona discharge is presumed to be lowered so that the corona discharge occurs in a stable manner as prevented from concentrating on some of the pointed ends due to the working errors or mounting errors of the poles. Accordingly, the current value of the primary winding of the transformer can be reduced for power saving while the air ionization efficiency can be increased. In addition, the elongated first and second poles are able to generate a large quantity of corona discharge at a time, thereby producing a large quantity of ozone.

[0022] According to ~~one~~ another preferred ~~mode of the invention~~ structural arrangement, the ~~ion generator has an arrangement wherein the~~ first poles of the ion generator are disposed at plural places arranged peripherally of the second pole as presenting their respective flat surfaces to a peripheral surface of the second pole ~~(claim 6)~~. This arrangement provides an even greater ozone generation.

[0023] The ion generator may have an arrangement wherein the first pole is formed with plural lines of pointed ends whereas the second pole is disposed in correspondence to each of the lines of pointed ends ~~(claim 7)~~. This arrangement also provides a greater ozone generation.

[0024] It is preferred in the inventive ion generator that the first pole is formed from

tungsten ~~(claim 8)~~. In this case, the pointed ends of the first pole resist oxidation by ozone even if they are heated to about 1000°C. by the corona discharge so generated and hence, the subsequent generation of corona discharge will not be obstructed. In addition, tungsten does not act as a catalyst assisting the reaction of ozone on the surface of the first pole.

[0025] The ion generator of-the invention may be provided in an air charging system for supplying air to an internal combustion engine ~~(claim 9)~~. In this case, a highly efficient combustion of the internal combustion engine is ensured.

[0026] The ion generator ~~of the invention~~ may have ~~an~~ a structural arrangement wherein the intake port of the casing is provided with a dust filter whereas the exhaust port is provided with a ~~silocco~~ sirocco fan for discharging ionized air ~~(claim 10)~~. In this case, air filtered by the dust filter may be continuously introduced into the casing, efficiently ionized and discharged out of the casing. This provides for an efficient supply of ozone to a combustion apparatus such as a boiler, incinerator or the like.

[0027] The ion generator ~~of the invention~~ may have ~~an~~ a structural arrangement wherein the intake port of the casing is provided with a dust filter whereas the exhaust port is provided with an air pump for discharging ionized air ~~(claim 11)~~. In this case as well, the air filtered by the dust filter may be continuously introduced into the casing, efficiently ionized and discharged out of the casing.

[0028] The ion generator of the invention may further comprise a solar panel for converting the radiation energy of the solar light to an electrical energy, and a power source section comprising a storage battery for storing the electrical energy ~~(claim 12)~~. In this case, the ion generator is portable because the current for corona discharge is supplied from the power source section. Equipped with the solar panel and designed for automatic storage of the electrical energy, the ion generator can be used for an extended period of time without recharging from utility power.

[0062] FIG. 9 is a sectional view showing an ion generator according to a sixth embodiment of the invention. The ion generator essentially has the same arrangement as the ion generator of FIG. 1, except that the cylindrical casing 1 is provided with a dust filter 9 at one aperture 1c thereof and with a ~~siloceo~~ sirocco fan 10 at the other aperture id thereof. The ~~siloceo~~ sirocco fan 10 operates to introduce the air into the casing 1 through the dust filter 9 removing dust contained in the introduced air.

[0063] According to this embodiment, disposed in the air-flow passage A are a power source section 7, the high-voltage generator along with an electric circuit component 6, and the ionization electrode 3, the power source section located on the uppermost stream side and followed by the others in this order. The power source section 7 contains therein a plurality of storage batteries 71 which are each connected to a solar panel 8 as an external component. The solar panel 8 converts the radiation energy of the solar light to an electrical energy which is stored in the storage batteries 71. The power source section 7 is connected with the electric circuit component 6 which is connected with a power cable for a motor 10a of the ~~siloceo~~ sirocco fan 10. The high-voltage generator 2 contains therein the electric circuit component for high-voltage generation. In addition to the storage batteries 71 for storing the electrical energy supplied from the solar panel 8, the power source section 7 may further contain there in a storage battery for storing an electrical energy supplied from an AC power source.

[0064] The above arrangement is adapted to apply a high voltage between the positive pole 31a and the negative pole 32a of the ionization electrode 3 by using the power from the storage batteries 71 of the power source section 7. Thus is generated the corona discharge between the positive and negative poles where the continuously introduced air through the dust filter 9 is ionized to generate ozone which is discharged from the casing 1 by means of the ~~siloceo~~ sirocco fan 10.

[0065] This process generates the corona discharge B in a stable manner just as in the first embodiment, allowing for the reduction of the current value of the primary winding of the transformer and achieving an efficient air ionization. The ion generator of this

embodiment uses the storage batteries 71 as the power source and hence is portable. Furthermore, the ion generator is equipped with the solar panel and designed for automatic storage of electrical energy so as to operate for an extended period of time without recharging the batteries with utility power. In this embodiment, the ~~silocco~~ sirocco fan 10 is provided at the aperture 1d. However, the fan at the aperture 1d may be replaced by an air pump 18.